Name:

Date:

**Urban Income**

A survey of adults living in the same urban area was conducted. The age and annual income of each adult was recorded. The data from this survey is summarized below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Annual income | | | Total |
| Age | $20,000 - $40,000 | $40,001 - $60,000 | Over $60,000 |  |
| 18 – 30 | 14 | 18 | 38 | 70 |
| 31 – 45 | 20 | 43 | 42 | 105 |
| 46 – 60 | 16 | 20 | 45 | 81 |
| Over 60 | 6 | 8 | 10 | 24 |
| Total | 56 | 89 | 135 | 280 |

1) What is the probability that a person chosen from this group of adults will be in the 31 – 45 age group?

2) What is the probability that a person chosen from those in this group whose incomes are over $60,000 will be in the 31 – 45 age group?

3) What is the probability that a person chosen from those in this group who are in the 31 – 45 age group have incomes over $60,000?

4) Chineme states that problems #2 and #3 are asking the same question – so should have the same answer. Is he correct? Why or why not?

5) Are being in the 31 – 45 age group and having incomes over $60,000 independent?

6) Are being in the 18 – 30 age group and having incomes between $20,000 and $40,000 independent?

**Math Task Solution Template**

**Content Standard:** S-CP-2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

**Standards for Mathematical Practice:**

MP2 – Reason abstractly and quantitatively.

MP5 – Use appropriate tools strategically.

MP3 – Construct viable arguments and critique the reasoning of others.

MP1 – Make sense of problems and persevere in solving them.

MP-6 – Attend to precision.

1) 105 of the 280 adults are in the 31 – 45 age group, so the probability is 105/280 = 3/8

2) 42 of the 135 people with incomes over $60,000 are 31 – 45 age group, so the probability is 42/135

3) 42 of the 105 people in the in the 31 – 45 age group have incomes over $60,000, so the probability is 42/105 = 2/5

4) Chineme is incorrect. Although both questions start with the group of people aged 31-45 with incomes over $60,000, they look at that group as part of different wholes. Question 2 considers what fraction those earning $60,000 or more are 31-45, and question 3 considers what fraction of those aged 31-45 earn $60,000 or more.

5) They are not independent. P(31 – 45 age group) = 105/280 = 3/8. P(incomes over $60,000) = 135/280=27/56. P(31 – 45 age group AND incomes over $60,000) = 42/280 = 3/20 81/448 =(3/8)(27/56) = P(31 – 45 age group)∙ P(incomes over $60,000)

6) They are independent. P(18 – 30 age group) = 70/280 = 1/4. P(incomes between $20,000 and $40,000) = 56/280=1/5. P(18 – 30 age group AND incomes between $20,000 and $40,000) = 14/280 = 1/20 = (1/4)(1/5) = P(18 – 30 age group)∙ P(incomes between $20,000 and $40,000)